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Solving the Problem of Excessive Time Delay in Attractor Reconstruction LOUIS PECORA, JON NICHOLS, THOMAS CARROLL, Naval Research Laboratory, LINDA MONIZ, US Geological Survey — We recently showed that the seemingly separate problems of finding a proper time delay and then finding a proper embedding dimension for attractor reconstruction are really the same problem which can be solved with a mathematical statistic faithful to the Takens reconstruction theorem. This approach also deals well with disparate time scales in data, and optimally choosing time series to use from a multivariate data set. However, the problem of when a time delay is too long for a chaotic time series remains. We introduce a new statistic that resolves this issue. The statistic is based on the mathematical observation that long time delays will result in data points that do not adequately populate the dynamical system's manifold. We present results with models and data that show we can predict when we have used excessively long time delays in attractor reconstruction.

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